

A survey of the avifauna of Obi island, North Moluccas, Indonesia

JOHN C. MITTERMEIER, H. EDEN W. COTTEE-JONES, ENDANG CHRISTINE PURBA, NOVA MAULIDINA ASHURI, EKA HESDIANTI & JATNA SUPRIATNA

The avifauna of eastern Wallacea remains little studied despite high diversity and endemism and basic knowledge of the ecology, taxonomy and distribution of species is lacking. Results of a two-month survey on Obi, North Moluccas, Indonesia, in July and August 2012 are presented here. General observations, point counts, mist-netting and interviews with villagers were carried out in five areas. A total of 109 species including 89 resident landbirds were recorded, of which 14 were new records for the island. Surveys up to 1,550 m extended the known altitudinal range of several species and resulted in the discovery of three montane species not previously recorded on Obi: Red-breasted Pygmy Parrot *Micropsitta bruijnii*, Mountain White-eye *Zosterops montanus* and Mountain Tailorbird *Orthotomus (Phyllergates) cucullatus*. Other notable records were five species of rail, including a surprising range extension of Drummer Rail *Habroptila wallacii* and observations of the poorly known Moluccan Woodcock *Scolopax rochussenii*. The biogeographical and conservation implications of findings and elevational turnover in bird communities on Obi are discussed. In line with recent surveys in other parts of Wallacea, this survey highlights the need for continued ornithological fieldwork in eastern Indonesia.

INTRODUCTION

Located at the boundary of two major biogeographical regions, Wallacea is exceptional for its diversity of species, conservation significance and opportunity to study evolution and speciation. Wallace's Line, marking the western boundary of Wallacea, is 'the most prominent and well-studied biogeographic division in the world' (Schulte *et al.* 2003) and the region is well known for inspiring Alfred Russel Wallace to develop his ideas on evolution by natural selection. Despite this, Wallacean birds remain poorly known: even basic distributional and life history information is lacking, and continued fieldwork is important for biological research and conservation in the region.

The mountainous island of Obi is the seventh largest in the North Moluccas, just over 2,500 km² in area and with a maximum elevation of 1,611 m. Even by Wallacean standards it has received little attention from ornithologists. It was not visited by Wallace although he spent considerable time on adjacent islands (Wallace 1869). H. A. Bernstein made the first ornithological collections in the early 1860s and there were visits by F. H. H. Guillemard in 1883, W. Doherty in 1897, a 'Mr. Lucas of Brussels' in 1898, J. Waterstradt in 1902, W. Goodfellow in 1907, A. M. R. Wegner in 1953, and R. Tatu and Y. Momou in 1982–1983 (White & Bruce 1986, P. M. Taylor pers. comm.). Recent records from Obi include observations by M. D. Linsley in 1989 (Linsley 1995), F. R. Lambert in 1992 (Lambert 1994), H. Bashari in 2010 (Bashari 2011) and M. Thibault and others in 2010 (Thibault *et al.* 2013). Obi was visited by a joint expedition from the Louisiana State University Museum of Natural Science, the University of Oxford, and the University of Indonesia between 5 July and 27 August 2012; here new and interesting observations resulting from this fieldwork are reported and discussed.

STUDY AREA AND METHODS

Obi is similar to other islands in the Moluccas in being primarily covered by humid evergreen forest with narrow areas of coastal mangrove, scattered swamp-forests and an area of montane forest in the interior. Historically, Obi was inhabited intermittently with human settlement restricted to a few sites along the coast. Guillemard (1885) noted the island was uninhabited in 1883, but stated that 'it is said that years ago there were many people living

on the island, but pirates caused its desertion,' and Stibbe (1919) commented that 'permanent settlements [on Obi] are only found at Lawui river mouth (north coast) and at Akeklamo (south-west coast)'. Recently, however, human activity has transformed Obi—coconut plantations cover many lowland areas, with clove and nutmeg groves on the lower hills; logging has been extensive—no primary lowland forest was found during the visit, and a logging company manager doubted that any such forest remains on the island. In the highlands, selective logging was evident up to 1,100 m. Nickel ore deposits in the ultrabasic soils of west and south Obi have brought in large-scale mining operations which remove all native vegetation and topsoil, and have already caused serious degradation around Kawasi in the north-west.

In the Moluccas, south-east trade winds prevail in July and August and during the visit, the weather in north Obi—Jikotamo, Cabang Kiri River—was clear and sunny with predictable heavy downpours in the early afternoon. On the west coast—Danau Sagu, Kawasi—it was hot and dry with little to no rainfall, and in the south—Tanjung Rijang, montane areas north of Fluk—heavy rain was frequent, often beginning before dawn and continuing all day. Data collected in the southern highlands indicated rain or drizzle every day from 1 July to 4 August, with a total July rainfall of 792 mm.

Lambert (1994) had surveyed east Obi in 1992, and the 2012 expedition focused on the west of the island where five areas were studied (Jikotamo vicinity, Cabang Kiri River, Tanjung Rijang, Danau Sagu plus Kawasi, and the montane area north of Fluk) and 2–4 sites within each area were surveyed, 13 in all; in addition, more generally, we recorded birds in coastal and marine areas. Coordinates, dates, site details and descriptive notes are given in Table 1; see also Figure 1. Common forest plant species in the Telagabakti Persada logging concession at Tanjung Rijang included *Canarium balsamiferum* (Burseraceae) and dipterocarps *Shorea* spp., *Anisoptera thurifera*, *Hopea* spp. and *Vatica rassak*, similar to those in the lowlands of Seram (Marsden 1998).

Opportunistic observations were made by JCM and EC-J at all sites (total 630 hours), usually beginning just before dawn and continuing until after dark, with a break in the middle of the day. Sound recordings were made and are archived at the Macaulay Library, Cornell University. Point counts were carried out near the Cabang–Sumbali river confluence, at Plasma Nutfah, in the montane forest north of Fluk, and in the nickel mining area near Danau Sagu; unfortunately, however, although they contributed

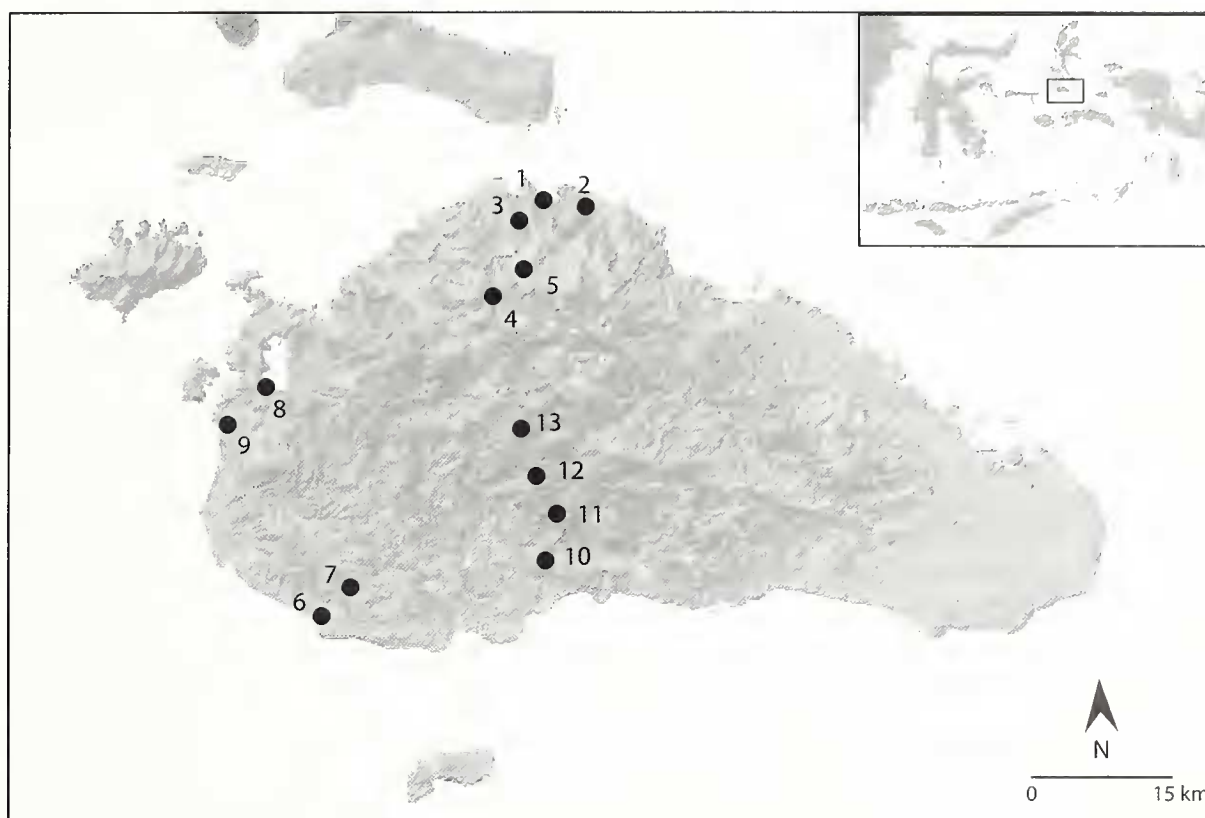


Figure 1. Map of Obi island, North Moluccas, Indonesia, showing locations of sites surveyed. Specific sites (see Table 1) are: (1) Jikotamo town, (2) Jikotamo–Sembiki Road, (3) Kampung Buton plantations, (4) Cabang–Sumbali confluence, (5) Cabang Kuning, (6) base camp Rijang, (7) Plasma Nutfah, (8) Danau Sagu lakeshore, (9) Kawasi town, (10) GPS mining camp, (11) ridge camp, (12) old logging road, (13) summit area.

Table 1. Individual sites visited between 5 July and 27 August 2012, showing dates of fieldwork and brief descriptions of habitat at each location (see Figure 1).

Specific site	Coordinates	Survey dates	Description; habitat and altitude (m)
Jikotamo vicinity			
1. Jikotamo town	1.344°S 127.655°E	6–8 July; 13, 20, 26–27 Aug	Large town and a principal port; coastline and village gardens (sea level).
2. Jikotamo–Sembiki Road	1.357°S 127.670°E	6–8 July; 26 Aug	Road from Jikotamo to Sembiki; coastal mangroves, coconut and clove plantations, secondary forest (sea level–35 m).
3. Kampung Buton plantations	1.346°S 127.644°E	6–9 July; 13 Aug	Agricultural land south of one of the largest towns; coconut plantations and open fields (sea level).
Cabang Kiri River			
4. Cabang–Sumbali confluence	1.398°S 127.649°E	10–13 July; 23–25 Aug	Cabang and Sumbali River confluence; lowland forest heavily logged in late 1990s, open gravel river beds, clove and cacao orchards (35–50 m).
5. Cabang Kuning	1.378°S 127.659°E	14–19, 21–23 Aug	Rice fields; wet rice paddies and swampy areas surrounded by flooded forest, clove and cacao plantations (30–45 m).
Tanjung Rijang			
6. Base camp Rijang	1.703°S 127.488°E	14–16, 18–22 July	Logging camp by the Rijang River mouth; extensive, selectively logged lowland forest, coconut plantations (sea level–100 m).
7. Plasma Nutfah	1.663°S 127.536°E	17–18 July	Lowland primary forest fragment (300 ha) along steep-sided gorge; designated as a seedbank. (110–300 m).
Danau Sagu and Kawasi			
8. Lakeshore	1.512°S 127.447°E	8–11 Aug	Largest freshwater lake; reed fringed open water, narrow strip of swamp forest, extensive dry savannah of the Kawasi nickel mine (160–350 m).
9. Kawasi town	1.547°S 127.413°E	11–12 Aug	Coastal town; coconut groves, freshwater swamp, extensive nickel mining area (sea level).
Montane area north of Fluk			
10. GPS mining camp	1.651°S 127.714°E	23–24 July; 5–6 Aug	Small exploratory mining camp; logged forest on sandy soil (370–550 m).
11. Ridge camp	1.604°S 127.721°E	26–28 July	Steep forest ridge; montane primary forest (850–950 m).
12. Old logging road	1.585°S 127.703°E	28 July–4 Aug	Abandoned highland logging road; montane primary forest, secondary growth along overgrown road (1,050–1,150 m).
13. Summit area	1.541°S 127.668°E	2–3 Aug	Ridgelines near the highest elevations in Obi's interior; montane primary forest (1,200–1,550 m).
Coastal and marine areas			
Obi coastline	–	5, 13, 23 July; 7, 13, 20, 28 Aug	Coastal boat trips between Fluk and Sembiki; beaches, inshore marine areas (sea level).

to the overall survey effort, insufficient data were obtained to do statistically significant analyses owing to the difficult terrain and weather conditions. Mist-netting was carried out in forest habitats at Plasma Nutfah and Tanjung Rijang (17 net hours), in the montane forest north of Fluk (416 net hours) and near Danau Sagu (271 net hours). A total of 46 local people from seven villages, particularly parrot-trappers, were interviewed. They were shown colour plates from Coates & Bishop (1997), asked to indicate species they were familiar with and occasionally also asked about species of specific interest. The interviews formed a part of more extensive, structured surveys focused on assessing local knowledge of the Moluccan Woodcock *Scolopax rochussenii* (Cortee-Jones *et*

al. 2013) and gathering information about parrot-keeping and trapping on Obi (Cortee-Jones *et al.* in prep.).

RESULTS

A total of 109 bird species was recorded including 14 new for the island (Appendix), nine of them resident landbirds: Red-breasted Pygmy Parrot *Micropsitta bruijnii*, Red-necked Crake *Rallina tricolor*, Bare-eyed Rail *Gymnocrex plumbeiventris*, White-browed Crake *Porzana cinerea*, Drummer Rail *Habroptila wallacii*, Purple Swamphen *Porphyrio porphyrio*, Little Black Cormorant

Phalacrocorax sulcirostris, Mountain White-eye *Zosterops montanus* and Mountain Tailorbird *Orthotomus (Phyllergates) cucullatus*. The others were a seabird, Great Frigatebird *Fregata minor*, and four migratory species: Common Greenshank *Tringa nebularia*, Wood Sandpiper *T. glareola*, Australian Hobby *Falco longipennis* and Intermediate Egret *Mesophoyx intermedia*.

The species observed in each area varied from 42 to 78 with the four lowland areas showing higher richness (mean 65.5 species) than the one highland area (42 species). In the lowlands, diversity was increased by migratory species: 6–8 migrants were recorded in each area but none was found in the highlands. Nonetheless resident landbird diversity was greater in the lowlands (mean 57.75) than the highlands, with the highest overall species diversity in logged forest with subsistence orchards on the Cabang Kiri River (74) and in selectively logged forest at Tanjung Rijang (69). In lowland areas the number of species recorded correlated directly with survey effort, with the greatest number of species being found where most time was spent.

Selected species accounts

Moluccan Cuckoo *Cacomantis heinrichi*

The taxonomy of *Cacomantis* cuckoos in the Moluccas is poorly understood. Recently, however, Thibault *et al.* (2013) concluded that, based on voice and plumage, the ‘Moluccan Cuckoo’ consists of the taxa *aeruginosus* (Obi, Buru, Ambon, Seram; usually considered a subspecies of Brush Cuckoo *C. variolosus*) and *heinrichi* (Halmahera and Bacan). We tentatively accept this judgement here.

In 2012 *Cacomantis* cuckoos were widespread on Obi, and there appeared to be two, possibly three, distinct types (Plate 1) that differed according to habitat preference, vocalisations, extent of rusty underpart colouration and presence of a yellow eye-ring. These observations suggest that at least two *Cacomantis* taxa occur on Obi—‘Moluccan Cuckoo’ and one, possibly two (potentially resident and migratory) subspecies of Brush Cuckoo. In contrast to Halmahera, where ‘Moluccan Cuckoo’ has been recorded or suspected only infrequently in montane forest (White & Bruce

1986, Tebb *et al.* 2008), on Obi it was widespread from sea level to above 1,150 m, relatively common and tolerant of moderate habitat disturbance. Further investigation of the taxonomy of this group is clearly necessary.

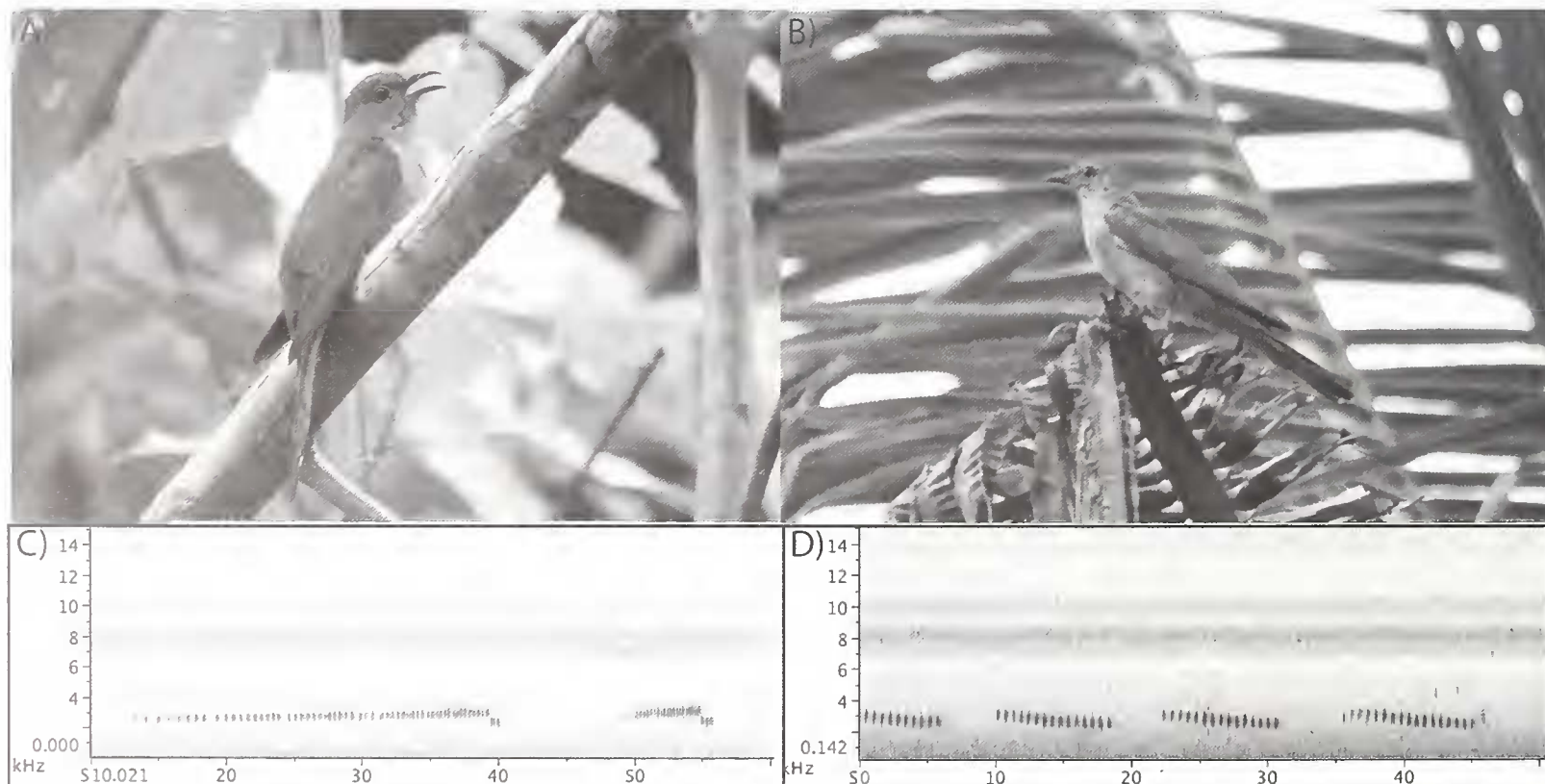
Chattering Lory *Lorius garrulus*

Vulnerable. A distinctive yellow-backed subspecies *flavopalliatus* is found only on Obi and Bacan. On Obi it is a popular village cage-bird and at least 40 individuals captured from the wild were seen in Kampung Buton and Jikotamo. The species is believed to be declining owing to trapping and habitat loss (BirdLife International 2013c), but was locally common where trapping was limited, specifically in the inaccessible montane forest north of Fluk and at Tanjung Rijang, where the Telagabakti Persada logging company enforces a trapping ban. It was seen from sea level to 1,100 m (and probably occurred higher), and around Tanjung Rijang was frequently found in selectively logged and primary forest fragments (Table 1). In contrast, it was not seen near Jikotamo or on the Cabang Kiri River. In this area, parrot trappers from Kampung Buton travelled inland beyond the study area to catch Chattering Lorries in the mountains. On 13 July, for example, a trapper travelled upriver from the Cabang–Sumbali confluence at 06h00 and returned at 12h00 with three lorries. Although trappers here claimed that the species had always been restricted to inland areas, it was common in similar habitat near the coast at Tanjung Rijang, suggesting that the species has been extirpated near Jikotamo, Kampung Buton and Laiwui.

Red-breasted Pygmy Parrot *Micropsitta bruijnii*

In Wallacea, this inconspicuous montane species was previously known only from Seram (subspecies *pileata*) and Buru (subspecies *buruensis*). On 3 August a group of six Red-breasted Pygmy Parrots was seen in montane primary forest between 1,350 and 1,550 m in central Obi. One was seen very well, perched in the open for 2–3 minutes. It had emerald-green upperparts and flanks, black spots on the wing-coverts, dull red underparts turning to orange on the undertail-coverts, a diffuse blue-green collar, creamy-

Plate 1. Two *Cacomantis* cuckoos found on Obi: (A) Moluccan Cuckoo *Cacomantis aeruginosus* and (B) Brush Cuckoo *C. variolosus*. Although similar in appearance these species differed in habitat use (former in lowland swamp-forest, dense secondary forest and montane forest, latter in open agricultural areas and coconut plantations) and vocalisations. Sonagrams (using Raven Lite 1.0) show: (C) a 50-second segment of vocalisations following playback of the Moluccan Cuckoo and (D) a 50-second segment of vocalisations following playback of Brush Cuckoo (in both cases, calls are from the individual bird shown above).



white throat and cheeks and a whitish-brown cap offset by a grey-brown band extending from the bill through the eye and to the side of the neck. The colour of the collar, crown, cheeks and eye-line of this bird differed from descriptions and images of both *pileata* and *buruensis* (Coates & Bishop 1997, Arndt & Persullessy 2010) and *bruinjii* from New Guinea (Juniper & Parr 1998) so this population may be an undescribed taxon meriting conservation concern.

Swiftlets *Collocalia* sp.

Apart from the omnipresent Glossy Swiftlet *Collocalia esculenta*, swiftlets in the north Moluccas are a field identification challenge because of the difficulty in distinguishing between Uniform Swiftlet *C. vanikorensis* and the dark-rumped *infuscata* subspecies of Moluccan Swiftlet *C. infuscata*. Lambert (1994) tentatively identified both Uniform Swiftlet and the white-rumped *ceramensis* subspecies of Moluccan Swiftlet, sometimes considered a distinct species, on Obi.

Dark-plumaged swiftlets were common and frequently seen flying high above the canopy. There appeared to be three morphotypes: (1) blackish upperparts and grey underparts with a distinct white rump-band; (2) brown upperparts and underparts with no obvious rump-band; (3) blackish upperparts and blackish-brown underparts with a hint of a brown rump-band. The white-rumped birds were the least common of the dark swiftlets and usually seen in flocks of 10–30 either alone or in multi-species flocks. Dark-rumped swiftlets occurred both in small flocks and, more frequently, in flocks of several hundred birds. The first two plumage types accord with Lambert's identification of Moluccan Swiftlet *ceramensis* and Uniform Swiftlet on Obi. The third type may simply be variation within Uniform Swiftlet or potentially the dark-rumped *infuscata* subspecies of Moluccan Swiftlet.

White-throated Pigeon *Columba vitiensis*

This species is known from all the nearby island groups (White & Bruce 1986), but was not recorded on Obi until Thibault *et al.* (2013) found it at 1,000 m in 2010. A single individual was seen flying along the forest edge at Cabang Kuning (20 m). This suggests that it is rare on Obi across a wide altitudinal range. Local parrot-trappers near Jikotamo were familiar with the species and reported that it feeds on the ground in the forest.

Scarlet-breasted Fruit Dove *Ptilinopus bernsteini*

Subspecies *micrus* (Jany 1955) diagnosed principally by its smaller size (White & Bruce 1986), is endemic to Obi. Lambert (1994) recorded it between 180 and 600 m. It was uncommon in lowland plantations in the Cabang Kiri River area (35–50 m) and relatively common in montane forest north of Fluk (800–1,550 m) where two males were mist-netted and measured on 27 July and 2 August. Wing measurements (140 mm) were slightly above the known size range for *micrus* wing (128–139 mm) (White & Bruce 1986).

Carunculated Fruit Dove *Ptilinopus granulifrons*

Endemic. Classified as Vulnerable (BirdLife International 2013d), this species was not seen from 1992 until 2011 (Bashari 2011). It was found to be widespread but inconspicuous in secondary forest near Cabang–Sumbali and in selectively logged forest near Tanjung Rijang. One was also seen in montane forest at 1,100 m. It was usually found feeding in fruiting trees in groups of 2–10 individuals; often the only indication of its presence was a distinctive wing-flapping as birds moved between branches. Although only one bird was found in montane forest, given its inconspicuous behaviour it is possibly found at higher altitudes than previously thought. These findings concur with the known distribution and habitat of the closely related Grey-headed Fruit Dove *P. hyogaster* on Halmahera (Gibbs *et al.* 2001). Although Carunculated Fruit Dove is not listed

for the island of Bisa (Gibbs *et al.* 2001), local people reported its presence there, and this and other outlying islands are worth further investigation.

Cinnamon-bellied Imperial Pigeon *Ducula basilica*

The distinctive subspecies *obiensis* (Hartert 1898) is endemic to Obi and may warrant recognition as a full species. It was fairly common in disturbed and selectively logged habitats throughout the lowlands, where it appears to tolerate moderate habitat disturbance, and was common in montane forest above 800 m.

Pied Imperial Pigeon *Ducula bicolor*

The taxonomy of this species in the Moluccas remains poorly understood owing to confusion between the status of *Ducula bicolor* and '*D. melanura*' (White & Bruce 1986). Coates & Bishop (1997) listed *melanura* for Obi but Gibbs *et al.* (2001) concluded that *melanura* is either a morph of *bicolor* or the result of genetic introgression between *bicolor* and *spilorrhoa* of New Guinea. Birds observed on Obi showed some traits of *melanura*, including a greenish-horn bill and extensive black to the outer rectrices, but lacked black markings on the undertail-coverts. This mix of traits appears to support the conclusion of Gibbs *et al.* (2001).

Red-necked Crake *Rallina tricolor*

In the Moluccas this species is previously known from Ambon and Tayandu (White & Bruce 1986, Taylor 1998). It was common in wet, closed-canopy forest around Cabang Kuning (14–22 August), where substantial rainfall had left pools of standing water in many areas of the forest and uncommon along the Jikotamo to Sambiki road (26 August). Birds vocalised frequently, particularly at dusk, and responded strongly to playback. Elsewhere, Red-necked Crakes apparently migrate from New Guinea to the Cape York Peninsula in the wet season (Taylor 1998), and records from Ambon in June–July were also considered to be migrants from New Guinea (White & Bruce 1986). Given the lack of previous records, it may also be a seasonal visitor to Obi.

Bare-eyed Rail *Gymnocrex plumbeiventris*

In the Moluccas, this species occurs on Halmahera, Bacan and Morotai but has not previously been recorded on Obi. It is also found on Misool and New Guinea (White & Bruce 1986, Taylor 1998). It was uncommon in swamp-forest surrounding the Cabang Kuning rice-fields, where two were recorded on 18–19 and 22 August. It occurred in the same habitat as Red-necked Crake. Vocalisations included steady gulping noises while foraging, and a loud barking call followed by a bizarre, trumpeting *woooo-wooot* in response to playback (recordings at: macaulaylibrary.org).

White-browed Crake *Porzana cinerea*

This widespread species has been recorded in the Moluccas from Kai, Ambon, Seram, Bacan and Halmahera (White & Bruce 1986, Coates & Bishop 1997). It was heard and seen on 9 and 11 August in a dense reedbed on the south-west edge of Danau Sagu, where Purple Swampphen (see below) was also observed. One was flushed from the wet rice-fields at Cabang Kuning on 16 August. Although its presence on Obi is not surprising given its distribution, these are apparently the first records for the island.

Moluccan Bush-hen *Amaurornis moluccana*

First recorded on Obi by Lambert (1994), one was also heard in 2010 by Thibault *et al.* (2013). At lowland sites it was relatively common, although inconspicuous—at least four pairs were found along a 2-km stretch of river near Tanjung Rijang, and a minimum of three pairs was present in swamp-forest bordering the Cabang Kuning rice-fields. It was also found in secondary growth along an old logging road in montane forest at 1,150 m.

Drummer Rail *Habroptila wallacii*

This species was previously believed to be endemic to Halmahera (White & Bruce 1986, Taylor 1998). However two birds were observed and recorded in dense swamp-forest near Cabang Kuning on 17–18 August. Local people were familiar with the species and reported frequently catching it in snares set for scrubfowl. Six interviewees reported it in the Jikotamo–Kampung Buton area, one in Tanjung Rijang and one in Wayloar. This suggests it is relatively widespread in the lowlands. It is considered a delicacy on Halmahera (Taylor 1998, P. M. Taylor pers. comm.) and three local people confirmed eating them although others stated that they released rails from snares because of their strange appearance. Two hunters described collecting eggs from a nest on a palm stump about 0.5 m tall, a description that agrees with the record of a nest from Halmahera (Bashari & van Balen 2011). Given that the Drummer Rail is believed to be flightless (de Haan 1950, Taylor 1998), its presence on Obi is intriguing and warrants further study.

Purple Swampphen *Porphyrio porphyrio*

White & Bruce (1986) described this species as ‘very local’ in Wallacea—it occurs on most of the large islands (e.g. Sulawesi, Buru, Seram, Halmahera), but is absent from smaller islands such as Bacan, Morotai, Misool and the Sulas (White & Bruce 1986, Taylor 1998). Four Purple Swampphens were seen in dense reedbeds on the south-west edge of Danau Sagu, the only large freshwater lake, on 9 and 11 August. Parrot-trappers and local people near Jikotamo and Kampung Buton were not familiar with the species despite its large size and distinctive appearance and it may be very localised or restricted only to the marshes around Danau Sagu.

Moluccan Woodcock *Scolopax rochussenii*

Endangered (BirdLife International 2013e). An enigmatic species, known only from Obi (fewer than 10 records) and one specimen collected on Bacan in 1902. It went unrecorded from 1982 until 2010 when Thibault *et al.* (2013) observed it near Soligi and east of Jikotamo. The species was found to be uncommon but widespread and conspicuous when displaying at dawn and dusk. Birds were observed displaying over swamp-forest and along rivers and stream valleys from 15–1,150 m. The distribution and conservation status of this species are described by Cottee-Jones *et al.* (2013).

Migratory waders

A variety of shorebirds migrate through east Wallacea but in general the region supports relatively low numbers of migrants and does not appear to be a major wintering area (White 1975, Coates & Bishop 1997). Information on timing and distribution of migrants is sparse. A flock of three Wood Sandpipers *Tringa glareola* was near Kawasi on 11 August and a single on the rice-fields at Cabang Kuning from 18–22 August, with a single Common Greenshank *Tringa nebularia*. Both species are common passage and wintering migrants in the Moluccas but not previously recorded on Obi (White & Bruce 1986, Coates & Bishop 1997). Common Sandpiper *Actitis hypoleucos* was seen on 11 August at Danau Sagu and again on 13 August at Kampung Buton. Red-necked Phalaropes *Phalaropus lobatus* were seen on 27 August, when over 40 were just off the coast near Jikotamo and in the strait between Obi and Bacan, but were not observed on six boat trips through the same area between 6 July and 20 August. Both are common wintering species in the Moluccas, with several previous records from Obi.

Australian Hobby *Falco longipennis*

Non-breeding individuals of the nominate subspecies occur in small numbers in the Moluccas and have been recorded on Ternate, Ambon and Seram (White & Bruce 1986). A single bird was seen and photographed at dusk near Kawasi on 11 August—the first record for Obi.

Little Black Cormorant *Phalacrocorax sulcirostris*

Widespread in the Moluccas with reports from Bacan, Halmahera, Buru and Seram amongst others (White & Bruce 1986). A single flying over a river near the Cabang–Sumbali confluence on 11 July is the first record for Obi. In contrast, Little Pied Cormorant *P. melanoleucos* was relatively common in freshwater habitats around Kawasi and Danau Sagu.

Intermediate Egret *Mesophoyx intermedia*

In Wallacea, a widespread but generally uncommon non-breeding visitor from Australia, subspecies *plumifera*, and the Palearctic subspecies *intermedia* (White & Bruce 1986). In the Moluccas it has been recorded widely including Bacan, Buru and Seram but until now not Obi. One was foraging in a wet grassy field near the Cabang Kuning rice-fields on 16 August. The black tip to the bill and the entirely black legs suggested the subspecies *intermedia*.

Great and Lesser Frigatebird *Fregata minor* and *F. ariel*

Both Great and Lesser Frigatebird occur throughout Wallacea (White & Bruce 1986, Coates & Bishop 1997). Lesser Frigatebird appears to be more frequent around Obi and was reported by Linsley (1995). It was seen three times during coastal boat journeys and flying over the shore at both Tanjung Rijang and Kawasi. On 21 July, JCM observed two Great Frigatebirds soaring with six Lesser Frigatebirds over the coast at Tanjung Rijang. Great Frigatebird has been reported from Halmahera, Buru, Ambon and Seram in the North Moluccas but not previously from Obi.

Slaty Monarch *Myiagra galeata*

This Moluccan endemic is common on Obi (Coates & Bishop 1997) although information on its nesting behaviour is limited. A pair was nesting in an isolated tree near Jikotamo on 7 July. The tree, roughly 15 m high, was in a cattle pasture about 10 m from the forest edge. The nest was located on a fork in a branch about 12 m above the ground in the subcanopy. It consisted of a small woven cup approximately 5 cm in diameter with sides built up about 5 cm high and was constructed of neatly woven plant fibres mixed with bark and lichen. The male and female took turns in the nest and appeared to be incubating.

Mountain White-eye *Zosterops montanus*

This species is found in montane habitats above 1,000 m on Seram, Bacan, Ternate (subspecies *obstinatus*) and Buru (subspecies *montanus*), but has not previously been recorded on Obi. On 29 July, a dense flock of about 25 individuals was feeding with about 10 Cream-throated White-eyes *Z. atriceps*, along an old road-cut in montane forest at 1,120 m. The Mountain White-eyes were obviously smaller and more compact and had olive upperparts, head, flanks and undertail-coverts, with a bright yellow throat and underparts, conspicuous broken white eye-rings, dark irises, black legs and bill. On 1 August a flock of about 50 Mountain White-eyes was feeding in the same trees and on 2 August two flocks were seen at 1,100 m and a third flock at 930 m.

Cream-throated White-eye *Zosterops atriceps*

First discovered on Obi in 1992 by Lambert (1994) who reported it uncommon between 220 and 700 m and described birds as closely resembling nominate *atriceps* from Bacan, it was subsequently seen in 2010 by Thibault *et al.* (2013). It was common and conspicuous from 500–1,100 m in montane forest north of Fluk, but was not recorded below 500 m. Elsewhere it mainly occurs in lowlands up to 700 m (White & Bruce 1986, Coates & Bishop 1997).

Mountain Tailorbird *Orthotomus (Phyllergates) cucullatus*

In Wallacea previously recorded in montane forest on Bacan, (subspecies *batjanensis*), Buru and Seram (subspecies *dumasi*), and

Sulawesi, four subspecies. White & Bruce (1986) found little difference between these taxa and questioned their validity. Mountain Tailorbird was found in montane forest north of Fluk between 900 and 1,200 m on 27 July–4 August. It was common in patches of dense vegetation, often near old landslides or treefalls.

Island Leaf Warbler *Phylloscopus poliocephalus*

The subspecies *waterstradti* found on Obi and Bacan was originally described as a distinct species by Hartert (1903). It was one of the commonest species in forest from 500–1,550 m, where it was a frequent and vocal member of mixed-species flocks.

Species not recorded

Several species which were not observed deserve mention because they were either (a) familiar to local people but not seen during the fieldwork, or (b) reported or predicted in earlier accounts but were neither seen during fieldwork nor familiar to interviewees. The technique of showing interviewees plates in a field guide is known to have drawbacks (Diamond & Bishop 1999), but in some circumstances the results merit reporting. The people on Obi were particularly knowledgeable about large and conspicuous birds, parrots, terrestrial birds caught in snares, and nectarivores that visited the flowers of clove trees.

Species for which there were at least two independent local reports were: a large black eagle, presumably either Gurney's Eagle *Aquila gurneyi* or Black Eagle *Ictinaetus malayensis*, Buff-banded Rail *Gallirallus philippensis*, Barred Rail *G. torquatus*, Common Koel *Eudynamis scolopacea* and Sulawesi Myzomela *Myzomela chloroptera*. The myzomela was first collected on Obi in 1982 by R. Tatu and Y. Momou (White & Bruce 1986) and was observed in the highlands by Thibault *et al.* (2013). Clove harvesters near Kampung Buton reported that *cui merah* (a red sunbird) occasionally visited their trees.

Notable species not seen and unfamiliar to local people even after specific questioning, included: White Cockatoo *Cacatua alba*, Moluccan Scrubfowl *Eulipoa wallacii*, Goliath Coucal *Centropus goliath*, Ivory-breasted Pitta *Pitta maxima*, Red-backed Buttonquail *Turnix maculosus*, White-breasted Woodswallow *Artamus leucorhynchus* and Long-billed Crow *Corvus validus*. All these have been listed for Obi in earlier accounts (White & Bruce 1986, Coates & Bishop 1997) and are distinctive in appearance. Failure to record them could be due to several factors, including inaccurate historical records, vagrancy or local extinction and their status warrants further investigation.

In the case of White Cockatoo, there has been confusion as to whether the species was once native (White & Bruce 1986) and has been extirpated or only ever occurred as an escaped population (Lambert 1994). Most parrot-trappers were familiar with it, but identified it as being from Bacan. Villagers in Air Mangga Indah in north Obi, however, reported several white cockatoos living in the nearby hills. These observations support Lambert's suggestion that the species is not native but may occur as small populations of escaped birds near human habitations.

DISCUSSION

The discovery of 14 new species for Obi is comparable with recent findings on other Wallacean islands (Trainor 2002, Rheindt *et al.* 2010, Trainor *et al.* 2012) and re-emphasises the need for on-going fieldwork in the region. On Obi a good example of data deficiency is provided by the Rallidae. Prior to the 2012 fieldwork, the family was known on the island only from records of Moluccan Bush-hen (Lambert 1994, Thibault *et al.* 2013). In 2012 the bush-hen and an additional five species were recorded, whilst local hunters reported up to four further species. Clearly Obi is not depauperate

in rallids and, despite its relatively small size, hosts rail diversity comparable to larger Moluccan islands such as Buru (eight species), Seram (seven), and Halmahera (seven) (Coates & Bishop 1997). From a distributional standpoint, 10 of these records are of species that occur on islands both north (e.g. Halmahera, Bacan) and south (e.g. Seram, Buru) of Obi, so their presence is not surprising. Nine of the new records are resident breeding species and are of particular significance in understanding the island's ecology and biogeographical relationships. From a distributional standpoint, five of them occur on islands both north (Halmahera, Bacan) and south (Seram, Buru) of Obi, and consequently their presence is unsurprising. As Coates & Bishop (1997) pointed out, however, 'one of the more striking features of Moluccan birds is the seemingly haphazard occurrence of certain families and species'; therefore, confirming whether apparent range disjunctions are real or a sampling artefact is essential. Obi has been grouped with Halmahera, Bacan and Morotai in a North Moluccan biogeographical unit (White & Bruce 1986, Carstensen & Olesen 2009) and it is therefore tempting to conclude that Obi's avifauna is a subset of that of Halmahera. The remaining four additions to the Obi list are two species, Drummer Rail and Bare-eyed Rail, which appear to support the connection with Halmahera, but two that are apparently absent from Halmahera with their closest known populations to the south (Red-breasted Pygmy Parrot) and to the east (Red-necked Crake).

Elevational turnover

The difference between montane and lowland bird communities in Melanesia (Mayr & Diamond 1976) and Wallacea (Poulsen & Lambert 2000) has been of long-standing scientific interest, and in both regions the altitudinal range of a species may vary from island to island (Mayr & Diamond 1976, Arndt & Persuley 2010). The altitudinal range of each species observed on Obi is reported in the Appendix. Many species recorded up to 1,150 m are probably found higher, as survey time above this elevation was limited.

Seven species were found to be common in the highlands but were not seen in the lowlands, and 25 species seen frequently in lowland forests were not seen in the highlands. The species restricted to the upland forests include three seen down to 300–500 m and four only found in the higher forests above 850 m (see Appendix). This may partly be due to sampling deficiencies, but it is clear that avian communities on Obi change substantially with increasing elevation—in contrast to Halmahera where the lack of a distinct montane bird community is attributed to the limited and fragmented nature of forest cover at higher altitudes (Poulsen & Lambert 2000).

Conservation implications

Obi is treated as Important Bird Area ID 202 (BirdLife International 2013a) within the Northern Maluku Endemic Bird Area (BirdLife International 2013b). A 45,000 ha nature reserve lying between 500 and 1,611 m in the central highlands has been proposed (MacKinnon & Artha 1981). It is unclear whether this reserve has been officially accepted and where exactly it is located. Most people questioned on Obi seemed unaware of it and logging appears to be on-going or to have taken place in most parts of Obi.

Four aspects of our results have particular conservation significance. (1) As elsewhere in the Moluccas, highland and lowland bird communities differ substantially and conservation programmes must take account of habitats at all elevations across the island. Some endemic taxa are rare in or absent from the lowlands e.g. Scarlet-breasted Fruit Dove, Pale Cicadabird *Coracina ceramensis hoogerwerfi* and Island Flycatcher *Eumyias panayensis obiensis*, whereas others are rare or absent from the highlands e.g. Common Paradise-kingfisher *Tanyiptera galatea obiensis* and Slender-billed Cicadabird *C. tenuirostris obiense*. The highlands hold the last

significant area of intact primary forest on the island, but the small size of this forest and logging operations so far as high as 1,100 m place it under threat. (2) Many forest bird species on Obi seem to be resilient to moderate logging and habitat change. In particular, endemic taxa and species of conservation concern including Chattering Lory, Carunculated Fruit Dove and Moluccan Woodcock were observed on many occasions in selectively logged forest. This suggests that these degraded forests should be incorporated into conservation strategies on the island. Conservation measures may benefit from considering existing local cultural values. Survival of forest and reedbeds around Danau Sagu, for example, is primarily due to superstitions surrounding the lake. (3) The environmental impacts of nickel mining on Obi should be carefully evaluated before new areas, particularly in the southern highlands, are exploited. Unregulated nickel mining practices lead to a near-total transformation of the landscape and dramatic changes in the bird community. None of the three species of conservation concern or the endemic taxa with the exception of Drab Whistler *Pachycephala griseonota johni* and Northern Golden Bulbul *Alophoixus affinis lucasi*, was observed in the nickel mining area near Kawasi. (4) Parrot trapping on Obi continues on a significant scale for local and off-island sale and may threaten the survival of some species, in particular Chattering Lory. In 2012, no evidence of monitoring or regulation of the trade was seen. Lambert (1993) conducted an extensive study of the parrot trade in the North Moluccas and outlined clear catch and export quotas for both Chattering Lory and Violet-necked Lory *Eos squamata*. More recently, Crosby (2003) recommended that 'zero quotas' should remain in place for Chattering Lory until a reliable system of management is developed. It seems possible that habitat destruction and trapping have extirpated this species from parts of the island.

Future directions

It seems likely that more species will be added to Obi's bird list. Surveys in different seasons and with more focus on the eastern part of the island are recommended, and these should extend to the little-known satellite islands of Bisa, Obilatu, Tapat and Gomumu. From a taxonomic and biogeographic perspective, a top priority should be the targeted collecting of scientific specimens for morphological and molecular analyses—several species were encountered that may prove to be undescribed taxa or require clarification of their taxonomic status. A solid understanding of the taxonomy and biogeographical history of species on Obi will help set conservation priorities. From a conservation perspective, priorities include clarifying the status of the island's protected area, investigating the value of different types of human-modified habitats for birds, addressing the restoration of habitats following nickel mining, and monitoring and controlling the island's parrot trade.

ACKNOWLEDGEMENTS

Our research on Obi was generously supported by a National Geographic Society/Waitt Grant, a Ron & Mary Neal LSU Graduate Fellowship, a Thesiger Award from The Old Etonian Association, a Small Fieldwork Grant from the Royal Geographical Society (with IBG), a Graham Hamilton travel grant from St Edmund Hall, the Oxford University Expeditions Council and A. J. Tours & Travel. We thank our supervisors and referees for their generous help, in particular Frederick Sheldon, Robb Brumfield, Robert J. Whittaker, Paul Jepson, Rich Grenyer, Shonil Bhagwat and Stuart Butchart. For advice on ornithology and logistics in Indonesia we thank Frank Lambert, Hanom Bashari, Marc Thibault, Bruce Beehler, Allison Strying, Diah Asri, David Bishop, Nick Brickle, Dewi Prawiradilaga, Mohammad Irham and Richard Noske. Matthew Medler at the Macaulay Library of Natural Sounds, Cornell University, generously provided sound-recording equipment for JCM. Our work on Obi was only possible with the hospitality of local people, specifically

Bambang Setiawan, Pak Uspa, the heads of Kawasi, Gambaru, and Kampung Buton villages, Pak La Gode, La Ham and La Raidi of Kampung Buton, Adam and Ikhsan of Wayloar, and Nisha and her family in Jikotamo. John C. Mittermeier and H. Eden W. Cottee-Jones contributed equally to this work.

REFERENCES

- Arndt, T. & Persuleesy, Y. E. (2010) Red-breasted Pygmy Parrot *Micropsitta brijnii* on Seram and Buru. *BirdingASIA* 13: 49–54.
- Bashari, H. (2011) Rediscovery of Carunculated Fruit Dove *Ptilinopus granulifrons* on Obi, North Moluccas. *BirdingASIA* 16: 48–50.
- Bashari, H. & van Balen, S. (2011) First breeding record of the Drummer Rail *Habroptila wallacii*. *BirdingASIA* 15: 20–22.
- BirdLife International (2013a) Important Bird Areas factsheet: Pulau Obi. Downloaded from <http://www.birdlife.org> on 24/07/2013.
- BirdLife International (2013b) Endemic Bird Area factsheet: Northern Maluku. Downloaded from <http://www.birdlife.org> on 24/07/2013.
- BirdLife International (2013c) Species factsheet: *Lorius garrulus*. Downloaded from <http://www.birdlife.org> on 03/09/2013.
- BirdLife International (2013d) Species factsheet: *Ptilinopus granulifrons*. Downloaded from <http://www.birdlife.org> on 03/09/2013.
- BirdLife International (2013e) Species factsheet: *Scolopax rochussenii*. Downloaded from <http://www.birdlife.org> on 03/09/2013.
- Carstensen, D. W. & Olesen, J. M. (2009) Wallacea and its nectarivorous birds: nestedness and modules. *J. Biogeogr.* 36: 1540–1550.
- Coates, B. J. & Bishop, K. D. (1997) A guide to the birds of Wallacea. Alderley: Dove Publications.
- Cottee-Jones, H. E. W., Mittermeier, J. C. & Redding, D. W. (2013) The Moluccan Woodcock *Scolopax rochussenii* on Obi Island, North Moluccas, Indonesia: a 'lost' species is less endangered than expected. *Forktail* 29: 88–93.
- Crosby, M. J. (2003) *Saving Asia's threatened birds: a guide for government and civil society*. Cambridge UK: BirdLife International.
- Diamond, J. M. & Bishop, K. D. (1999) Ethno-ornithology of the Ketengban people, Indonesian New Guinea. Pp.17–46 in D. Medin & S. Atran, eds. *Folkbiology*. Cambridge Mass: MIT Press.
- Gibbs, D., Barnes, E. & Cox, J. (2001) *Pigeons and doves*. London: Christopher Helm.
- Guillemard, F. H. H. (1885) Report on a collection of birds obtained during the voyage of the yacht 'Marchesa' Part V. The Molucca Islands. *Proc. Zool. Soc. Lond.* 1885: 561–576.
- de Haan, G. A. L. (1950) Notes on the Invisible Flightless Rail of Halmahera (*Habroptila wallacii* Gray). *Amsterdam Naturalist* 1: 57–60.
- Hartert, E. (1898) On three new pigeons from the island of Obi Major, Moluccas. *Bull. Brit. Orn. Club* 7: 35.
- Hartert, E. (1903) The birds of the Obi Group, Central Moluccas. *Novit. Zool.* 10: 1–17.
- Jany, E. (1955) Neue Vogel-Formen von den Nord-Molukken. *J. Orn.* 96: 102–106.
- Juniper, T. & Parr, M. (1998) *Parrots: a guide to the parrots of the world*. Robertsbridge: Pica Press.
- Lambert, F. R. (1993) Trade, status and management of three parrots in the North Moluccas, Indonesia: White Cockatoo *Cacatua alba*, Chattering Lory *Lorius garrulus* and Violet-eared Lory *Eos squamata*. *Bird Conserv. Internatn.* 3: 145–168.
- Lambert, F. R. (1994) Notes on the avifauna of Bacan, Kasiruta, and Obi, Northern Moluccas. *Kukila* 7: 1–9.
- Linsley, M. D. (1995) Some bird records from Obi, Maluku. *Kukila* 7: 142–151.
- MacKinnon, J. & Artha, M. B. (1981) *A national conservation plan for Indonesia: Maluku & Irian Jaya*. 7. Bogor: UNDP/FAO National Parks Development Project.
- Marsden, S. J. (1998) Changes in bird abundance following selective logging on Seram, Indonesia. *Conserv. Biol.* 12: 605–611.
- Mayr, E. & Diamond, J. M. (1976) Birds on islands in the sky: origin of the montane avifauna of northern Melanesia. *Proc. Natn. Acad. Sci. USA* 73: 1765–1769.

- Payne, R. B. (2005) *The cuckoos*. Oxford: Oxford University Press.
- Poulsen, M. K. & Lambert, F. R. (2000) Altitudinal distribution and habitat preferences of forest birds on Halmahera and Buru, Indonesia: Implications for conservation of Moluccan avifaunas. *Ibis* 142: 566–586.
- Rheindt, F. E., Verbelen, P., Putra, D. D., Rahman, A. & Indrawan, M. (2010) New biogeographic records in the avifauna of Peleng Island (Sulawesi, Indonesia), with taxonomic notes on some endemic taxa. *Bull. Brit. Orn. Club* 130:181–207.
- Schulte, J. A., Melville, J. & Larson, A. (2003) Molecular phylogenetic evidence for ancient divergence of lizard taxa on either side of Wallace's Line. *Proc. Roy. Soc. B—Biol. Sci.* 270: 597–603.
- Stibbe, D. G. (ed.) (1919) *Encyclopaedic van Nederlandsch-Indie* [Encyclopedia of the Dutch East Indies], Leiden: Martinus Nijhoff.
- Stresemann, E. (1931) Zur Ornithologie von Halmahera und Batjan. *Ornithologische Monatsberichte* 39:167–171.
- Taylor, B. (1998) *Rails: a guide to the rails, crakes, gallinules and coots of the world*. New Haven: Yale University Press.
- Tebb, G., Morris, P. & Los, P. (2008) New and interesting bird records from Sulawesi and Halmahera, Indonesia. *BirdingASIA* 10: 67–76.
- Trainor, C. R. (2002) The birds of Adonara, Lesser Sundas, Indonesia. *Forktail* 18: 93–100.
- Trainor, C. R., Verbelen, P. & Johnston, R. E. (2012) The avifauna of Alor and Pantar, Lesser Sundas, Indonesia. *Forktail* 28: 77–92.
- Thibault, M., Defos du Rau, P., Pineau, O. & Pangimangen, W. (2013) New and interesting records for the Obi archipelago (north Maluku, Indonesia), including field observations and first description of the vocalisation of the Moluccan Woodcock *Scolopax rochussenii*. *Bull. Brit. Orn. Club* 133: 83–115
- Wallace, A. R. (1869) *The Malay Archipelago*. Singapore: Graham Brash.
- White, C. M. N. (1975) Migration of Palearctic waders in Wallacea. *Emu* 75: 37–39.
- White, C. M. N. & Bruce, M. D. (1986) *The birds of Wallacea (Sulawesi, the Moluccas and Lesser Sunda Islands, Indonesia)*. London: British Ornithologists' Union.
- John C. MITTERMEIER**, Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, LA, 70803, USA. Email: john.mittermeier@gmail.com (correspondence)
- H. Eden W. COTTEE-JONES**, Biodiversity Research Group, School of Geography and the Environment, Oxford University Centre for the Environment, South Parks Road, Oxford OX1 3QY, UK. Email: henry.cottee-jones@seh.ox.ac.uk
- Endang Christine PURBA**, Biology Department, Pascasarjana Program, Faculty of Mathematics and Natural Science, Universitas Indonesia, Gedung E lantai 2 Kampus UI Depok, West Java, Indonesia. Email: endang.christine@yahoo.com
- Nova Maulidina ASHURI**, Biology Department, Pascasarjana Program, Faculty of Mathematics and Natural Science, Universitas Indonesia, Gedung E lantai 2 Kampus UI Depok, West Java, Indonesia. Email: dina_ta_its@yahoo.com
- Eka HESDIANTI**, Biology Department, Pascasarjana Program, Faculty of Mathematics and Natural Science, Universitas Indonesia, Gedung E lantai 2 Kampus UI Depok, West Java, Indonesia. Email: eka.hesdianti@gmail.com
- Jatna SUPRIATNA**, Research Center for Climate Change, Universitas Indonesia, Gedung PAU UI lantai 8,5 Kampus UI Depok 16424, West Java, Indonesia. Email: jsupriatna@conservation.org

Appendix

Birds recorded on Obi, North Moluccas, Indonesia, from 5 July–27 August, 2012.

Locations: (1) Jikotamo town, (2) Cabang Kiri River area including Cabang Kuning and Cabang-Sumbali river confluence, (3) Tanjung Rijang logging camp, (4) Danau Sagu and Kawasi Town, (5) montane forest north of the Fluk and (6) coastal and marine areas around the island. Relative abundance letters are: (C) greater than or equal to 10 individuals per day, (F) 4–10 individuals per day, (U) 1–3 individuals per day, and (R) less than 1 per day. Legend: (p) species photographed, (s) sound-recorded, (m) mist-netted; others were seen or heard only.

Species	Locations						Legend	Altitudinal range (m)
	1	2	3	4	5	6		
Dusky Scrubfowl <i>Megapodius freycinet</i>		R	U			R	s	0–1,100
Spotted Whistling Duck <i>Dendrocygna guttata</i>		F			R		p,s,m	0–35
Papuan Hornbill <i>Aceras plicatus</i>	F	F	F	R	R		p,s	0–1,100
Dollarbird <i>Eurystamus orientalis</i>		R		R			p	0–30
Common Kingfisher <i>Alceda atthis</i>	U	U	U	U			p	0–160
Little Kingfisher <i>Alceda pusilla</i>	R			R				0–160
Variable Dwarf Kingfisher <i>Ceyx lepidus</i>	U	U		U			p,s	30–200
Blue-and-white Kingfisher <i>Tadiramphus diaps</i>	U	F	F	U			p,s,m	0–200
Beach Kingfisher <i>Tadiramphus sauraphaga</i>	R					U	p	0
Sacred Kingfisher <i>Tadiramphus sanctus</i>	F	U	U	U			p	0–200
Common Paradise-kingfisher <i>Tamysiptera galatea</i>	U	F	F				p,s	30–300
Rainbow Bee-eater <i>Meraps arnatus</i>	C	F	F	C			p,s	0–350
Brush Cuckoo <i>Cacamantis varialasus</i>	F	U	U				p,s	0–40
Moluccan Cuckoo <i>Cacamantis heinrichi</i>	U	U	U		U		p,s	0–1,150
Violet-necked Lory <i>Eas squamata</i>	C	F	C	U	F		p,s	0–1,550
Chattering Lory <i>Lorius garrulus</i>			F		C		p,s	0–1,150
Red-flanked Lorikeet <i>Charmasya placensis</i>	C	C	C	C	C		p,s,m	0–1,100
Red-breasted Pygmy Parrot <i>Micropsitta bruijnii</i>					R			1,350–1,550

Species	Locations						Legend	Altitudinal range (m)
	1	2	3	4	5	6		
Red-cheeked Parrot <i>Geoffroyus geoffrayi</i>		F	F	U	U		p,s	30–1,550
Great-billed Parrot <i>Tonygnothus megalarynchos</i>			U	R				0–300
Eclectus Parrot <i>Eclectus rorotus</i>	U	R	R					0–35
Glossy Swiftlet <i>Collocalia esculento</i>	C	C	C	C	C		p,m	0–1,150
Moluccan Swiftlet <i>Callacalia infuscata</i>		F		F			p,s	0–1,000
Uniform Swiftlet <i>Callacalia vonikarensis</i>		C	C	C				0–160
Dark swiftlet sp. <i>Collocalia infuscata/vanikarensis</i>	F	F	C	C	U			0–1,100
Moustached Treeswift <i>Hemiprocne mystocea</i>		C	F	R			p,s	0–300
Moluccan Scops Owl <i>Otus magicus</i>	U	U	U		U		p,s	30–1,100
Barking Owl <i>Ninox cannivens</i>		R	U	F			s	0–300
Large-tailed Nightjar <i>Coprimulgus macrurus</i>	U	U	U	U			s	0–300
Metallic Pigeon <i>Calumba vitiensis</i>		R						30
Spotted Dove <i>Streptopelia chinensis</i>	R						p	20
Brown Cuckoo Dove <i>Macropygia ambainensis</i>	U	U	C	F	C		p,s,m	0–1,150
Great Cuckoo Dove <i>Reinwardtaena reinwardtii</i>		R	R		R		s	30–1,100
Emerald Dove <i>Chalcophaps indico</i>	C	F	F		R		p,s,m	0–1,100
Nicobar Pigeon <i>Calaenas nicobarica</i>			R				p	150
Scarlet-breasted Fruit Dove <i>Ptilinopus bernsteinii</i>		R			U		p,m	30–1,550
Superb Fruit Dove <i>Ptilinopus superbus</i>		U					p,m	30–200
Carunculated Fruit Dove <i>Ptilinopus granulifrons</i>		U	U		R		p	30–1,150
Black-naped Fruit Dove <i>Ptilinopus melonospilo</i>				R				300
White-spectacled Imperial Pigeon <i>Ducula perspicillata</i>	F	C	C	R			p,s	0–300
Cinnamon-bellied Imperial Pigeon <i>Ducula basilica</i>	U	F	U	R	C		p,s	30–1,550
Pied Imperial Pigeon <i>Ducula bicolor</i>	U	U	U				p,s	0–150
Red-necked Crake <i>Rallina tricolor</i>	R	U					s	30–35
Bare-eyed Rail <i>Gymnacrex plumbeiventris</i>		U					s	30
Rufous-tailed Bush-hen <i>Amourarnis maluccanus</i>		F	F	R	R		s	0–1,150
White-browed Crake <i>Porzana cinereo</i>		R		U			s	30–160
Drummer Rail <i>Hobraptilo wollacii</i>		R					s	30
Purple Swampphen <i>Parphyria parphyria</i>				U			p,s	160
Moluccan Woodcock <i>Scolopox rochussenii</i>	U	U	U		U		p,s	15–1,150
Common Greenshank <i>Tringa nebularia</i>		R					s	30
Wood Sandpiper <i>Tringa glareola</i>		R		R			s	2–30
Common Sandpiper <i>Actitis hypoleucos</i>	R			R				0–160
Red-necked Phalarope <i>Phalaropus lobotus</i>						U		0
Great Crested Tern <i>Sterna bergii</i>	U					C		0
Black-naped Tern <i>Sterna sumatrana</i>						F		0
Bridled Tern <i>Sterna anaethetus</i>						F		0
Osprey <i>Pandion haliaetus</i>	U		U	U			p,s	0–300
Pacific Baza <i>Aviceda subcristata</i>	R	R	R	R			p	0–200
Brahminy Kite <i>Haliastur indus</i>	C	F	F	U	R		p	0–1,100
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>		R				R		0–30
Variable Goshawk <i>Accipiter novoehollandiae</i>	U	U	U	U			p,s	0–200
Rufous-necked Sparrowhawk <i>Accipiter erythrauchen</i>		R						30
Spotted Kestrel <i>Falco moluccensis</i>	U	U	U	U	R		p	0–1,050
Oriental Hobby <i>Falca severus</i>				R				350
Australian Hobby <i>Falca longipennis</i>				R			p	0
Brown Booby <i>Sula leucagaster</i>						U		0
Little Pied Cormorant <i>Phalacrocorax melanoleucas</i>				F			p	0–160

Species	Locations						Legend	Altitudinal range (m)
	1	2	3	4	5	6		
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>		R						30
Little Egret <i>Egretta garzetta</i>	U	U	U					35
Pacific Reef Egret <i>Egretta sacra</i>	R							0
Great-billed Heron <i>Ardea sumatrana</i>	R							0
Great Egret <i>Casmerodius albus</i>	F		U	U			p	0–160
Intermediate Egret <i>Mesophayx intermedia</i>		R					p	30
Rufous Night Heron <i>Nycticorax caledanicus</i>	U	U	U				p	0–30
Black Bittern <i>Dupetor flavicollis</i>	R		R					0
Great Frigatebird <i>Fregata minor</i>			R					0
Lesser Frigatebird <i>Fregata ariel</i>			F			F		0
Red-bellied Pitta <i>Pitta erythrogaster</i>	F	F	F		U		p,s,m	0–1,100
Dusky Myzomela <i>Myzomela obscura</i>	U	U	U	U	U		p	0–1,550
Golden Whistler <i>Pachycephala pectoralis</i>		C	U	F	C		p,s,m	30–1,550
Drab Whistler <i>Pachycephala griseanota</i>	F	F	F	F	F		p,s,m	30–1,550
Torresian Crow <i>Corvus arru</i>	U		U	U			p,s	0–200
Paradise-crow <i>Lycarax pyrrhapterus</i>	F	C	C	U	C		p,s,m	30–1,550
White-bellied Cuckooshrike <i>Caracina papuensis</i>	U	F	F	F			p,s	0–350
Slender-billed Cicadabird <i>Caracina tenuirostris</i>		U	U				p,s	30–150
Pale Cicadabird <i>Caracina ceramensis</i>		R			F		p	30–1,550
Rufous-bellied Triller <i>Lalage aurea</i>	F	F	C	F	R		p,s	0–1,100
Willie-wagtail <i>Rhipidura leucaphrys</i>	F	U	U	F			p,s	0–350
Northern Fantail <i>Rhipidura rufiventris</i>	U	F	F	F	C		p,s,m	0–1,350
Rufous Fantail <i>Rhipidura rufifrons</i>					F		s	860–1,550
Hair-crested Drongo <i>Dicrurus hottentottus</i>	F	F	F	U	F		s	0–1,550
Island Monarch <i>Manarcha cinerascens</i>				R				200
Spectacled Monarch <i>Manarcha trivirgatus</i>	U	F	F	U	F		p,s	0–1,100
Slaty Monarch <i>Myiagra galeata</i>	U	F	F	F	F		p,s	0–1,150
Shining Monarch <i>Myiagra alecta</i>	F	F	F		R		p,s	0–950
Island Flycatcher <i>Eumyias panayensis</i>			R		F		p,s	300–1,150
Island Starling <i>Aplanis mysalensis</i>	U	U	F	C			p,s	0–350
Shining Starling <i>Aplanis metallica</i>	C	C	C				p,s,m	0–30
Barn Swallow <i>Hirunda rustica</i>	U		U	U				0–350
Pacific Swallow <i>Hirunda tahitica</i>	F		F	F				0–160
Golden Bulbul <i>Alphaxius affinis</i>	F	C	C	U	C		p,s,m	0–1,150
Mountain White-eye <i>Zosterops mantanus</i>					F		s	930–1,150
Cream-throated White-eye <i>Zosterops atriceps</i>					F		p,s	500–1,150
Mountain Tailorbird <i>Orthotomus (Phyllergates) cucullatus</i>					U		p,s	950–1,250
Island Leaf Warbler <i>Phyllascapus paliacephala</i>					C		p,s	500–1,550
Flame-breasted Flowerpecker <i>Dicaeum erythrorhax</i>		U	F	U	U		p,s	0–1,350
Black Sunbird <i>Nectarinia aspasia</i>	C	C	C	C	C		p,s	0–1,150
Olive-backed Sunbird <i>Nectarinia jugularis</i>	C	U	F	F			p,s	0–350
Eurasian Tree Sparrow <i>Passer mantanus</i>	C		C				p	0–35
Black-faced Munia <i>Lanchura malucca</i>	U	C	C				p,s	0–35